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Recent Results on Top, Bottom and Exotic Physics at the Tevatron

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Recent Results on Top, Bottom and Exotic Physics at the Tevatron

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ABSTRACT

A summary of results from the recently concluded 1992-93 Tevatron run is presented. Selected topics from b physics and exotic particle searches from the CDF and D0 collaborations are reviewed. Preliminary results from the CDF top search, using $12pb^{-1}$ from the 1992-93 run, are given. In particular, the lepton + b-tag and dilepton analyses are discussed. Preliminary results from the CDF dilepton analysis places a lower limit on the top quark mass of $108GeV/c^2$ at the 95% C.L.

1 Introduction

The Tevatron has recently completed its 1992-93 collider run. This run marked the resumption of data taking at CDF after a three year shutdown and the successful commissioning of the new D0 experiment.

1.1 *The CDF Detector*

Between the 1988-89 and 1992-93 runs, numerous upgrades have been made to the CDF detector. Of particular interest are the upgraded muon system and the addition of a silicon tracking detector around the beampipe. A new central preradiator system, consisting of MWPC's mounted between the solenoid coil and the central EM calorimeter, gives an additional factor of 2-3 in electron-pion separation. Many other improvements were also made, including upgrades to the lepton triggers and improved electron systems.

The upgraded muon system consists of two parts. The Central Muon upgrade (CMP) adds a steel wall of ~ 3 hadronic interaction lengths and additional layers of muon chambers outside the previous Central Muon system (CMU). This increases the total number of interaction lengths to ~ 8 to 10 in the region $|\eta| < 0.6$. The Central Muon extension (CMX) provides muon identification in the region out to $0.6 < |\eta| < 1$.

The Silicon Vertex detector (SVX) consists of two barrels in the region $|z| < 26cm$. There are four layers of single-sided silicon wafers per barrel, providing precision $r\phi$ tracking information. The layers are arranged from $r = 3$ to $8cm$. This covers a region out to $|\eta| < 1.9$ at the outermost layer. The impact parameter

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resolution of the device is better than $40\mu m$ for tracks with $P_T > 1GeV/c$. Using preliminary alignment constants, we obtain an impact parameter resolution of $\sim 13\mu m$ for tracks with $P_T > 10GeV/c$. Readout of the 46080 SVX channels is made possible by sparsification performed on the readout chips mounted next to the silicon wafers.

1.2 *The D0 Detector*

D0, the second major Tevatron detector, was commissioned for the 1992-93 run. This detector is a large multipurpose detector, whose design stresses uniform, hermetic, fine-grained calorimetry, large solid angle coverage, and excellent muon detection. The detector is composed of three major components: the inner central tracking system, the liquid argon calorimeter, and the muon system.

The central tracking system consists of the Vertex Chamber, Transition Radiation Detector, Central Drift Chamber, and Forward Drift Chambers. The Transition Radiation Detector provides an additional factor of ~ 50 in electron-pion separation. The Central Drift Chamber, in addition to charged particle tracking, provides dE/dx measurements which can be used to discriminate photon conversions. The Forward Drift Chambers provide tracking down to $5°$.

D0 uses uranium and liquid argon sampling calorimeters in both the central and forward regions. Each region contains an electromagnetic and hadronic calorimeter with resolutions of approximately $15\%/\sqrt{E}$ and $50\%/\sqrt{E}$, respectively. The calorimeters provide essentially hermetic coverage.

The D0 wide angle muon system consists of large iron toroids and sandwiched by layers of proportional drift tubes in the central and forward regions. The wide angle system identifies muons to $|\eta| < 1.7$. With the small angle muon system in the far forward and backward regions, D0 has muon coverage down to $|\eta| < 3.4$.

2 Selected Results in b Physics at the Tevatron

The large b cross section at the Tevatron provides an excellent opportunity to study b production and decay. Using the 1992-93 data, b production cross sections are being measured at CDF and D0 through inclusive electron, muon, and dilepton final states. A partial list of topics under study at the Tevatron experiments include exclusive final state reconstruction, lifetimes, mixing, and rare decays. Three topics, b lifetimes, the observation and mass measurement of the B_s, and $B^0\overline{B^0}$ mixing will be summarized in the following sections.

2.1 *Inclusive and Exclusive b Lifetimes from CDF*

The average B hadron lifetime in a high statistics sample of $B \to J/\psi X$ decays has been measured at CDF [1]. Using J/ψ candidates from the dimuon trigger, muon tracks passing strict quality cuts are vertexed. The dimuon system is required to have a good reconstructed vertex in the SVX, with invariant mass within $50MeV/c^2$

of the J/ψ mass. For each J/ψ candidate, a two-dimensional decay length L_{xy} is calculated. The proper time of the B decay is then estimated by the 'pseudo-$c\tau$':

$$\lambda = L_{xy} \frac{M_{\psi}}{P_T^{\psi} \times F} \tag{1}$$

where F is a correction factor to get the actual P_T of the B from the measured P_T^{ψ}. The resultant 'pseudo-$c\tau$' distribution is shown in figure 1. This distribution is fitted to three sources of dimuon events in the J/ψ region:

- J/ψ's from B decays, parameterized by a Gaussian convoluted with an exponential. The fit parameter f_b gives the fraction of J/ψ coming from B.
- J/ψ's directly produced in $p\bar{p}$ collisions or resulting from decay of short-lived intermediate states (*e.g.* χ_c). This is parameterized by a Gaussian centered at $\lambda = 0$.
- Background from processes whose invariant mass accidentally falls within the J/ψ mass window. This contribution is obtained from the J/ψ mass sidebands. The background fraction f_{BGR} is determined from the sidebands and is not a free parameter to the overall fit.

The overall fit gives an inclusive B hadron lifetime of $1.46 \pm 0.06(stat) \pm 0.06(sys) ps$.

In addition the the inclusive lifetime, exclusive B hadron lifetimes have been measured at CDF. These measurements are similar to the inclusive measurement, but no correction factor F is needed for the fully reconstructed states, and there is no prompt background component to subtract. The $B^{\pm}$ lifetime is measured through the decay $B^{\pm} \rightarrow J/\psi K^{\pm}$. In addition to the $J/\psi \rightarrow \mu\mu$ selection, a $K^{\pm}$ candidate is required with $P_T(K^{\pm}) > 2GeV/c$. The three tracks are then fitted to a common vertex. A preliminary measurement of the $B^{\pm}$ lifetime gives $1.58 \pm 0.27 \pm 0.17 ps$.

The neutral b lifetime is measured in the process $B^0 \rightarrow J/\psi K^*$, with $K^* \rightarrow K\pi$. The $K\pi$ candidates are required to have an invariant mass within $80 MeV/c^2$ of the K^* mass, with $P_T(K\pi) > 2GeV/c$. The four tracks are then fitted to a common vertex. A preliminary measurement of the B^0 lifetime gives $1.33 \pm 0.31 \pm 0.17 ps$.

2.2 *Observation and Mass Measurement of the B_s at CDF*

CDF has observed fully reconstructed B_s^0 mesons through the decay chain $B_s^0 \rightarrow J/\psi\phi$, with $J/\psi \rightarrow \mu^+\mu^-$ and $\phi \rightarrow K^+K^-$ [2]. J/ψ candidates are obtained from the dimuon trigger with a threshold of $P_T(\mu) > 3GeV/c$. The candidates are selected by requiring the difference between the dimuon mass and the world average J/ψ mass of $3096.9 MeV/c^2$ to be consistent within 3σ, where σ is the mass uncertainty calculated for each dimuon candidate. ϕ candidates are selected by requiring the invariant mass of two oppositely charged tracks assigned kaon masses to be within $10 MeV/c^2$ of the $1019.4 MeV/c^2$ ϕ mass. The $\mu^+\mu^-K^+K^-$ system is vertex constrained while simultaneously constraining the dimuon mass to the world average J/ψ mass. The resultant $J/\psi K^+K^-$ mass distribution is shown in figure 2. The mass of the B_s^0

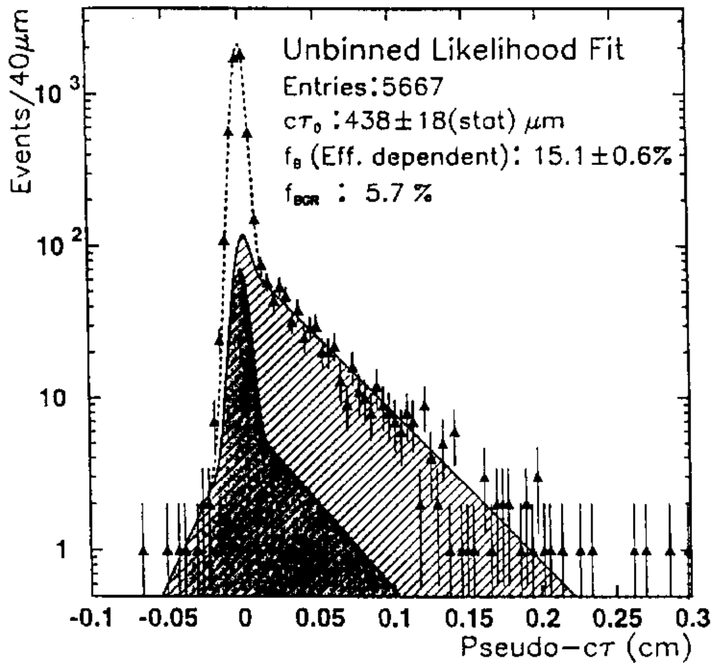

Figure 1: 'Pseudo-$c\tau$' λ distribution for the signal region. Superimposed are unbinned likelihood fits to background, signal, and prompt decays. The dark-shaded region is the contribution from background. The light-shaded region is the sum of the background and a Gaussian convoluted with the exponential from $B \to J\psi X$. The remaining unshaded area is the Gaussian centered at $\lambda = 0$ due to prompt decays. The dashed curve represents the overall fit.

meson is determined from a binned maximum likelihood fit to the $J/\psi K^+K^-$ mass distribution using a linear background and a Gaussian signal distribution. The fit result is 14.0 ± 4.7 fully reconstructed B_s^0 candidates at a mass of $5383.3 \pm 4.5(stat) \pm 5.0(sys) MeV/c^2$.

2.3 *$B\overline{B}$ Mixing Measurement at D0*

D0 has made a preliminary measurement of $B^0\overline{B^0}$ mixing through the process $p\overline{p} \to B^0\overline{B^0}$, where $B^0 \to \mu^+\nu X$ and $\overline{B^0} \to B^0 \to \mu^+\nu X$. Events with two muons, each with $P_T > 2GeV/c$ and $|\eta| < 1$, are selected. To remove dimuons from J/ψ and cascade decays, the dimuon mass is required to be above $6GeV/c^2$. Cuts on $\Delta\phi$ and $\Delta\theta$ remove cosmic rays. In addition to the muon selection, a jet with $E_T > 8GeV$ is required. In a preliminary data sample of $5.6pb^{-1}$, D0 measures R, the ratio of like-sign dimuon events to unlike-sign dimuon events, to be $0.51 \pm 0.06(stat) \pm 0.02(sys)$. Accounting for all processes which lead to dimuon final states, the mixing parameter χ can be calculated.

$$\chi = \frac{Br(B^0 \to \overline{B^0} \to \mu^-\overline{\nu}X)}{Br(B^0 \to \mu^+\nu X) + Br(B^0 \to \overline{B^0} \to \mu^-\overline{\nu}X)}$$

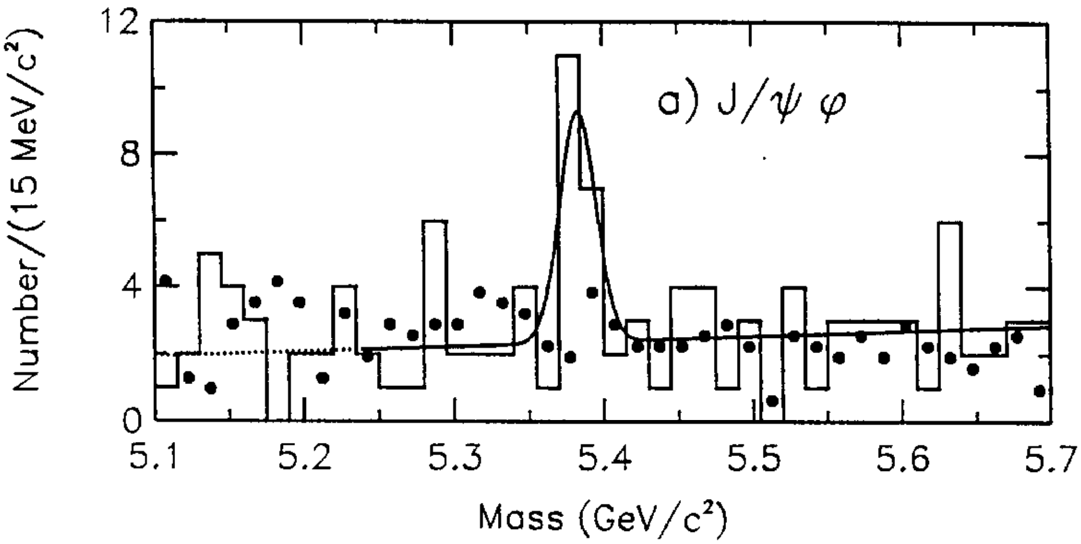

Figure 2: The $J/\psi K^+K^-$ mass distribution for K^+K^- within $10MeV/c^2$ of the ϕ mass (solid histogram), and for the normalized ϕ sideband region (dots).

D0 obtains a preliminary value of $\chi = 0.14 \pm 0.03(stat) \pm 0.06(sys)$.

3 Selected Results in Exotic Physics at the Tevatron

3.1 *Excited Quarks Search at CDF*

A search for excited quarks (q^*), produced via quark-gluon fusion and decaying into common quarks through the emission of a photon ($qg \to q^* \to q\gamma$), has been made at CDF. From $3.3pb^{-1}$ of data from the 1988-89 run and a preliminary sample of $9.8pb^{-1}$ from the 1992-93 run, events with a well identified isolated photon are selected. Cuts of $E_T(\gamma) > 30GeV$ and $> 70GeV$ are made on the 88-89 and 92-93 data, respectively. To reduce systematic uncertainties and statistical errors, no subtraction of residual isolated neutral mesons (π^0, η, K_s^0) which mimic isolated photons is made. The leading jet in each event is assumed to be from the final state quark from the q^* decay. Assuming a 2-body decay, the excited quark mass is given by the photon+jet mass $M = 2P_T(\gamma)\cosh\eta^*$, where $\eta^* = (\eta_\gamma - \eta_{jet})/2$. To reduce QCD background, kinematic cuts of $|\eta_{jet}| < 2$ and $|\eta^*| < 0.8$ are made.

The resultant photon+jet mass distribution is shown in figure 3. Also shown is the NLO QCD calculation for $\gamma+$ jet. Using a binned maximum likelihood fit, the mass spectrum can be compared to that expected from a hypothetical excited quark signal plus QCD background, where the q^* theoretical prediction is from

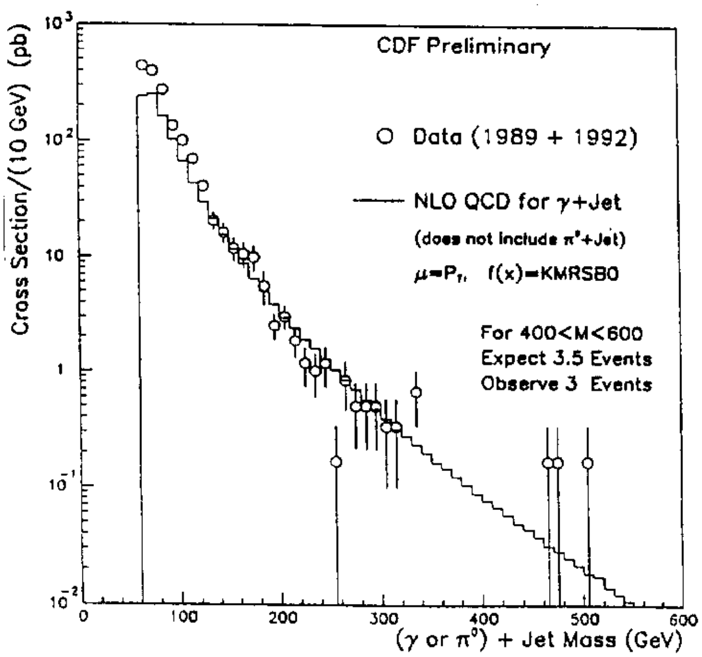

Figure 3: The 'photon' + leading jet mass spectrum from the combined 1988-89 and 1992-93 data for $|\eta(\gamma)| < 0.9$. The histogram is the NLO calculation of isolated prompt photon production with absolute normalization. Not included in the QCD calculation is the contribution from π^0+ jet.

reference [3]. The resultant 95% C.L. upper limit on the q^* cross section as a function of q^* mass is shown in figure 4. From this data, a lower mass limit of $M_{q^*} > 470 GeV/c^2$ at the 95% C.L. can be placed on the hypothetical excited quark. This preliminary limit includes statistical uncertainties only.

3.2 *Leptoquark Search at D0*

D0 is searching for strong pair production of a first generation scalar leptoquark LQ_1, where $LQ_1 \rightarrow eq$ or νq. Two search methods are currently being employed. The first looks for the process $p\bar{p} \rightarrow LQ_1\overline{LQ_1} \rightarrow eqeq$ by selecting events with two electrons and two jets. Event selection starts from the dielectron triggers. In a preliminary sample of $7.5pb^{-1}$, 2486 events contain two electron candidates, each with $P_T > 15GeV$. The events are then required to have two good electrons, each with $E_T > 20GeV$, and two jets, each with $E_T > 20GeV$. There are 14 events passing the electron quality cuts and kinematic cuts. Dielectrons with mass consistent with the Z mass are discarded. After all cuts, no events remain. The calculated efficiency for these cuts is $14.0 \pm 1.8\%$ for a leptoquark of mass $100GeV/c^2$ and rises with increasing mass.

The second method selects events with one electron, missing $\not{E}_T$, and two jets. This corresponds to the case where one of the leptoquarks decays into eq and the other to νq. For this search, events are required to have one good electron

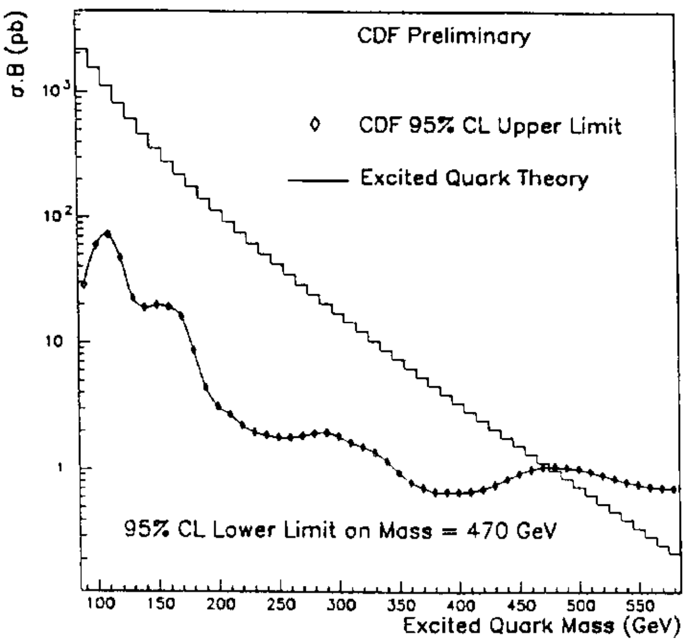

Figure 4: Preliminary 95% C.L. upper limit on the q^* cross section as a function of q^* mass from the 1988-89 and 1992-32 data. The histogram gives the theoretical prediction for the cross section from reference [3].

with $E_T > 20GeV$, $\not{E}_T > 30GeV$, and two jets, each with $E_T > 20GeV$. There are 171 events passing the electron quality cuts and kinematic cuts. To remove $W + 2$ jet background, a requirement of $M_T > 95GeV/c^2$ is made on the $e\nu$ transverse mass. In addition, if $E_T(e) - \not{E}_T < 25GeV$, then the electron ϕ cannot be within 0.4 radians of the back-to-back direction of the $\not{E}_T$. After all cuts, no events remain. The calculated efficiency for these cuts is $6.2 \pm 0.8\%$ for a leptoquark of mass $100GeV/c^2$ and rises with increasing mass.

Based on the observation of 0 events in the two search methods, limits on the first generation leptoquark mass can be placed as a function of $Br(LQ_1 \rightarrow eq)$. Results are plotted in figure 5. At the 95% C.L., the combined result places lower limits on the leptoquark mass at $126GeV/c^2$ for $Br(LQ_1 \rightarrow eq) = 100\%$ and $109GeV/c^2$ for $Br(LQ_1 \rightarrow eq) = 50\%$.

4 Search for the Top Quark at CDF

4.1 *Standard Model Top*

At the Tevatron, Standard Model top quarks are expected to be pair produced in $p\bar{p} \rightarrow t\bar{t}$ through quark annihilation and gluon fusion. Total cross sections fall with increasing top mass, from $100pb$ at $m(t) < 100GeV/c^2$ to $1pb$ above $200GeV/c^2$ [4] [5].

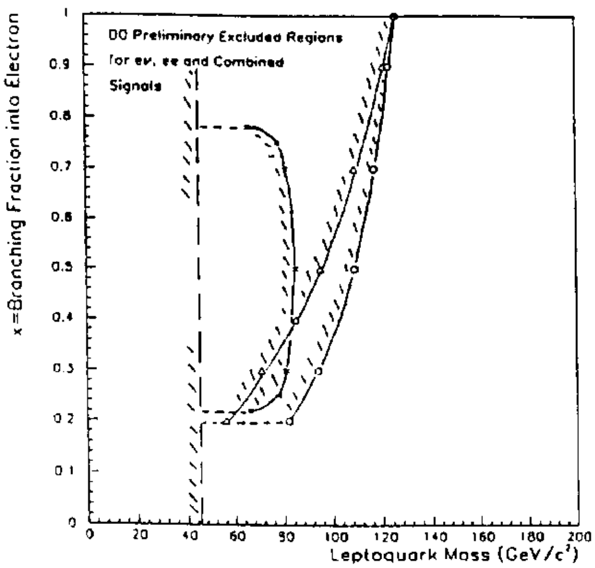

Figure 5: 95% C.L. limits on the leptoquark mass as a function of $Br(LQ_1 \rightarrow eq)$. The ee search results are given by the triangles. The $e\nu$ search results are given by the $*$. The combined results are given by the circles. The region excluded by LEP experiments is to the left of the vertical line.

Standard Model top quark decays proceed through $t \rightarrow W^+b$. The final state signatures follow from the W branching ratios. The dominant mode is $t\bar{t} \rightarrow 6$ jets. However, this mode suffers from large backgrounds and will not be covered in this review. The most promising channels in which to search for top are those with a high P_T lepton coming from $W \rightarrow l\nu$. Considering only electrons and muons, approximately 37% of $t\bar{t}$ events contain at least one lepton and 5% contain at least two leptons from $W \rightarrow e\nu$ or $\mu\nu$.

4.2 *Previous CDF Top Limits*

In previous CDF runs, several analyses using inclusive lepton channels were used. For the 1988-89 run, final states with ee, $\mu\mu$, and $e\mu$ were looked for. In addition, CDF has searched for a low-transverse-momentum muon as a tag of the b quark in events with a high P_T electron or muon and at least 2 jets. From a $4.1pb^{-1}$ data sample, a lower limit of $m(t) > 91 GeV/c^2$ was set at the 95% confidence level [6].

Additional constraints on the top mass can be placed from electroweak measurements. Using measurements of the W mass and assuming a Higgs mass of less than $1000 GeV/c^2$, an upper limit on m_{top} of approximately $225 GeV/c^2$ is obtained at 95% C.L. This implies that the relevant mass range for Standard Model top searches is 91 to $\sim 225 GeV/c^2$. Current estimates based on standard model parameters give a top mass of $\sim 165 GeV/c^2$.

The following sections summarize the top search at CDF using the high P_T single lepton and dilepton channels. For the single lepton channel, a b-tag, either using the SVX or soft lepton, is also employed. In addition to these methods, CDF is studying the use of the single lepton channel with kinematic cuts, all-hadronic decay channels, and τ decay channels. These analyses will not be covered in this review.

5 Top Search with b-Tagging at CDF

The high P_T lepton + jets channel, with its relatively high branching ratio ($\sim 37\%$), provides a good way to select $t\bar{t}$ events. The signature of such events is at least one high P_T electron or muon, missing energy from the accompanying neutrino, and at least two b jets. However, W+jets background may prove troublesome for higher mass top. Using kinematical cuts alone, a signal to noise ratio of worse than 1 to 1 for a top mass greater than $100 GeV/c^2$ is obtained. By tagging at least one of the accompanying b jets, the background can be substantially reduced. For the 1992-93 Tevatron run, two methods of b-tagging are being employed at CDF. The first utilizes the tracking information from the SVX, and tags the b through displaced tracks. The second, an extension of the soft lepton analysis used in the 88-89 CDF run, looks for a semileptonic decay of the b.

5.1 *b-Tagging with the SVX*

With its precision tracking information, the SVX can be used to tag the decay products of long-lived particles, in particular b-flavored hadrons. These decay products can be tagged by their impact parameter (d) relative to the primary event vertex. We also use impact parameter significance (S_d), which is the impact parameter d divided by σ_d, the total error in d. The S_d distribution for tracks which are daughters of b-flavored hadrons falls slowly with increasing S_d.

Displaced tracks are selected by requiring a minimum d or S_d for each track. Minimum requirements on P_T are also made to reject very low momentum tracks which typically have poorer tracking resolution. Displaced tracks in an event can then be grouped into candidate b jets by various algorithms. Among the algorithms currently under study at CDF are Jet Vertexing, Jet Probability, and $d\phi$ Clustering. These three algorithms are briefly described here.

- *Jet Vertexing:* In the Jet Vertexing algorithm, which relies on reconstructing the secondary decay vertex of the b, displaced SVX tracks are assigned to jets if the track is within $25°$ of the jet axis. The displaced tracks in a given jet are vertex constrained. Tracks which contribute more than 20 to the total χ^2 of the fit are discarded. The vertexing is then iterated. Jets with at least two surviving tracks are tagged as b jet candidates.

- *Jet Probability:* The Jet Probability algorithm assigns a probability, based on the SVX resolution function, to each SVX track that it comes from the primary vertex. The probabilities for individual tracks are combined to give an overall probability for each jet in the event. Jets with a low probability that it comes from the primary are tagged as b jets.

- *$d\phi$ Clustering:* The $d\phi$ Clustering algorithm looks for correlations in d and ϕ, where d is the impact parameter and ϕ is the usual azimuthal angle in the transverse plane, Tracks from a secondary vertex lie on a sinusoid in $d\phi$ space, while tracks from the primary lie near $d = 0$. Clusters of tracks along sinusoidal segments are tagged as b jets.

For $m_{top} = 120 GeV/c^2$, these algorithms give SVX tagging efficiencies of about 22%, rising slightly with top mass. These efficiencies include SVX acceptance, but do not include any kinematic or high P_T lepton cuts.

In addition to selecting a high P_T lepton and SVX b-tagging, kinematic cuts are needed to suppress the W+jets background. In particular, kinematic cuts should be extremely useful in reducing the $Wb\bar{b}$ background in the b-tags [7]. Many different variables have been studied, including jet counting, energy variables, such as ΣE_T and $\hat{s}$, and shape variables, such as sphericity and aplanarity. The simplest, jet counting, is about as effective as any other method. For the top search, 3 or more jets are required. Preliminary results using a $\sim 9pb^{-1}$ sample of high P_T electron and muon events with $\not{E}_T > 20GeV$ are shown in figure 6. Two events are tagged in the signal region. A partial background calculation gives ~ 0.5 events expected in the signal region, where contributions from non-W events such as $b\bar{b}$ have not yet been included.

5.2 *b-Tagging with Soft Leptons*

Another method of b-tagging is to look for soft leptons from the processes $b \to l\nu X$ and $b \to cX \to l\nu X$. Naively, every $t\bar{t}$ event will have two b and two c quarks. Using $Br(b \to lX) \sim 20\%$ and $Br(c \to lX) \sim 20\%$, where $l = e, \mu$, this means $\sim 57\%$ of all $t\bar{t}$ events will have at least one electron or muon from b or c. These leptons will have low P_T, with the spectrum peaked towards 0. Preliminary efficiency calculations are given in table 1. Electron backgrounds arise from residual conversion electrons and early showering hadrons. Muon backgrounds arise from $\pi \to \mu$, $K \to \mu$, and punch-throughs. The fake tag rate is on the order of 10^{-2} per track.

Preliminary results using a $\sim 10pb^{-1}$ sample of electron and muon events with $\not{E}_T > 20GeV$ are shown in figure 7. For the top search, at least two jets with $E_T > 20GeV$ and at least one additional jet with $E_T > 10GeV$ are required.

6 Top Search with Dileptons at CDF

The high P_T ee, $\mu\mu$, and $e\mu$ dilepton channels have a total branching fraction of only $\sim 5\%$, but has the advantage of low background rates. The signature of such events is

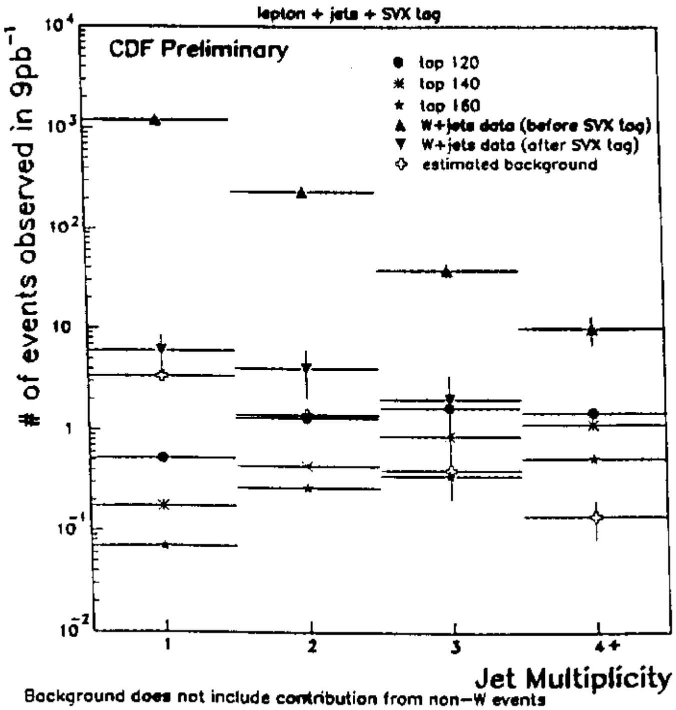

Figure 6: Number of events observed for different jet multiplicities (jet $E_T > 10GeV$) in the high P_T electron and muon samples. Data before and after requiring a Jet Vertex tag are given by the triangles. A partial estimate of the background (non-W contributions have not yet been calculated) is given by the open crosses. Expectations for top of 120, 140 and $160GeV/c^2$ are also shown. The search region for top is in the 3 and 4^+ jet bins.

Soft Lepton Efficiencies Per Event			
	Top Mass (GeV/c^2)		
Soft lepton cut	100	120	140
$P_T > 2GeV/c$	19%	23%	23%
$P_T > 4GeV/c$	13%	17%	18%

Table 1: Soft lepton tag efficiencies for various top masses. Efficiencies do not include kinematic and high P_T lepton cuts.

two high P_T leptons and missing energy from the neutrinos. Processes contributing to the background include QCD $b\bar{b}$, $Z \to b\bar{b}$ or $\to \tau\tau$, diboson production, and Drell-Yan lepton production.

In a preliminary data sample from the 1992-93 run, CDF requires the following:

- At least two leptons (e or μ), each with $P_T(l) > 20GeV/c$
- At least one lepton is isolated ($P_T < 3GeV/c$ in a cone of 0.25)
- $\not{E}_T > 25GeV$

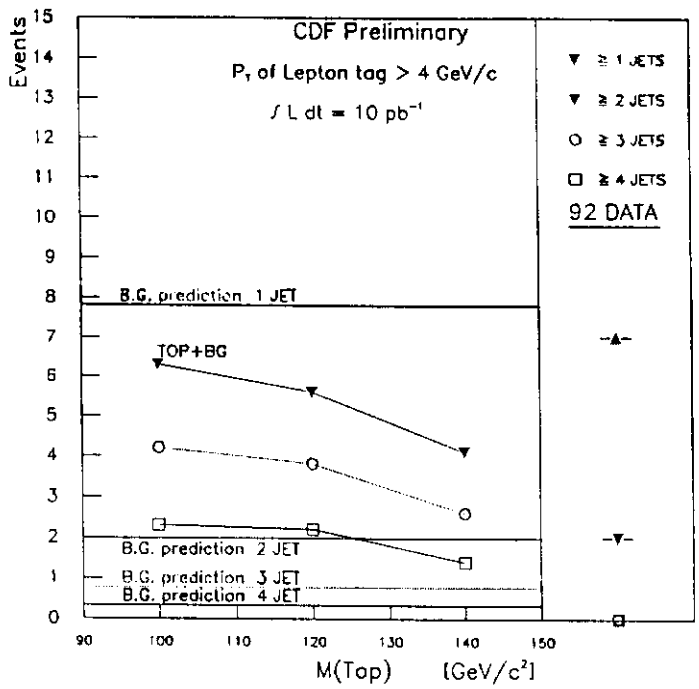

Figure 7: Preliminary results from the high P_T lepton + soft lepton top search. A soft lepton cut of $P_T > 4GeV/c$ is used. Data for different jet multiplicities are shown on the right side of the plot. Background predictions are given by the horizontal lines on the left side. Also shown on the left is expected top + background as a function of top mass. The search region for top is given by the ≥ 3 jets points.

- $\Delta(\phi_{ll}) < 160^\circ$
- Reject ee or $\mu\mu$ events with $70 < M_{ll} < 110GeV/c^2$

The expected number of top events as a function of top mass for $10pb^{-1}$ is given in table 2. For $M_{top} < 150GeV/c^2$, the diboson background is small compared to the signal. For higher mass top, a cut on the minimum amount of jet activity can be used to reduce backgrounds by a factor of ~ 10 to 100.

In a preliminary data sample of $12pb^{-1}$, one event passes all of the dilepton selection criteria. These preliminary results are plotted in figure 8, together with the theoretical calculation of $\sigma_{t\bar{t}}$ to order α_s^3 [5]. Combining this preliminary analysis with previously published CDF analyses [6], CDF can set a lower limit of $M_{top} > 108GeV/c^2$ at the 95% C.L.

7 Summary

CDF and D0 have concluded successful 1992-93 data runs. Initial physics results have already been presented on a variety of topics, with more forthcoming. Summaries of b physics and exotic physics, two of the major areas of interest at CDF

	Top Mass (GeV/c^2)			
	100	120	140	160
$\sigma_{t\bar{t}}$ (pb)	91	35	16	7.7
$\epsilon_{total} \times Br$ (%)	0.87	1.00	1.30	1.55
top events ($10pb^{-1}$)	7.9	3.5	2.0	1.2
background ($10pb^{-1}$)	1.36 ± 0.3			

Table 2: Summary of preliminary dilepton analysis for $10pb^{-1}$ of data. Shown are top cross sections, acceptances, and expected number of events as a function of top mass. Also shown is the expected number of background events in $10pb^{-1}$.

and D0, have been presented.

Another area of major interest is the search for top. CDF is working on a number of top search algorithms, including the dilepton and lepton + b-tag channels. The SVX provides a powerful new selection method for tagging b jets, which complements the soft lepton b-tag algorithm. With a $12pb^{-1}$ data sample, preliminary results from the CDF dilepton analysis places a lower limit on the top quark mass of $108GeV/c^2$ at the 95% C.L.

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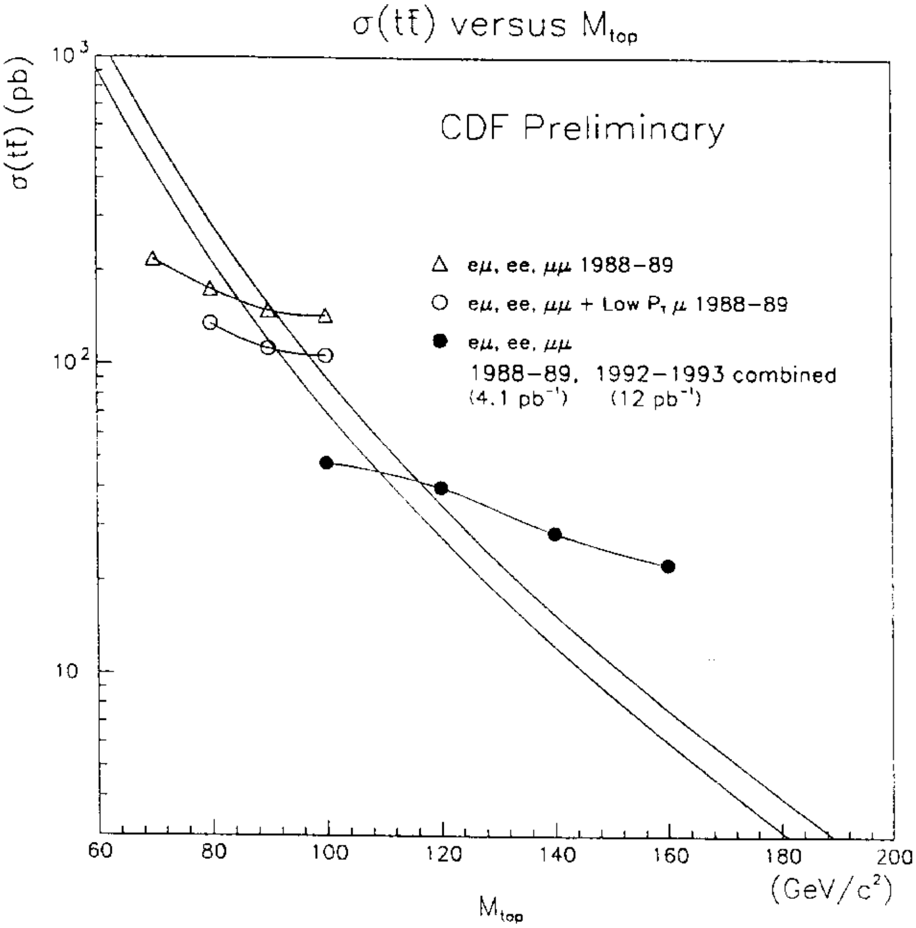

Figure 8: The CDF 95% C.L. limits on $\sigma_{t\bar{t}}$ compared with a band of theoretical predictions from reference [5]. The three sets of experimental limits are: (1) previously published 1988-89 dilepton analysis; (2) previously published 1988-89 dilepton and low P_T μ analyses; (3) combination of preliminary 1992-93 dilepton analysis and 1988-89 analyses. No background subtraction has been performed. The combined limit is $M_{top} > 108 GeV/c^2$ at the 95% C.L.